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AN ANALYSIS OF ADVANCEMENT TO HOSPITAL CORPSMAN CHIEF PETTY OFFICER

by

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March, 1995

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This thesis investigates whether certain demographic, background, or service-related variables affect the probabilities that a hospitalman recruit (HR) from the fiscal year 1979 (FY-79) cohort of Navy recruits would stay in the Navy through fiscal year 1992 (FY-92); be advanced to Hospital Corpsman Chief Petty Officer (HMC); and be advanced quickly to HMC in less than 11 years. One study focus was to determine whether women and minorities were equally represented, as compared to white males, in the advancement process to HMC. A second focus was to determine whether HRs who attained certain Navy Enlisted Classification (NECs) codes had probabilities of being advanced to HMC that were different than the probabilities for other general-duty hospital corpsmen (HMs). The sample was taken from the the FY-79 cohort data set of all Navy recruits and was restricted to non-prior service, HRs. Using this sample, three multivariate logit models were developed with these binary, dependent variables: MADEHMC denotes whether a HR was advanced to HMC; STAYEDIN denotes whether a HR stayed in the Navy through the end of FY-92; and FASTPROM indicates whether a HR was advanced to HMC within 11 years. The effects of various background, demographic, and service-related variables on the dependent variables were measured. The results indicate that women, blacks, Hispanics, and HMs with certain NECs were more likely than white, male, general-duty HMs to stay in the Navy through FY-92; that HMs with certain NECs were more likely than other HMs to be advanced to HMC; and that there were no significant variables for predicting whether a HR would be advanced to HMC within 11 years.

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AN ANALYSIS OF ADVANCMENT TO HOSPITAL CORPSMAN CHIEF PETTY OFFICER

by

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ABSTRACT

This thesis investigates whether certain demographic, background, or service-related variables affect the probabilities that a hospitalman recruit (HR) from the fiscal year 1979 (FY-79) cohort of Navy recruits would stay in the Navy through fiscal year 1992 (FY-92); be advanced to Hospital Corpsman Chief Petty Officer (HMC); and be advanced quickly to HMC in less than 11 years. One study focus was to determine whether women and minorities were equally represented, as compared to white males, in the advancement process to HMC. A second focus was to determine whether HRs who attained certain Navy Enlisted Classification (NECs) codes had probabilities of being advanced to HMC that were different than the probabilities for other general-duty hospital corpsmen (HMs). The sample was taken from the the FY-79 cohort data set of all Navy recruits and was restricted to non-prior service HRs. Using this sample, three multivariate logit models were developed with these binary, dependent variables: MADEHMC denotes whether a HR was advanced to HMC; STAYEDIN denotes whether a HR stayed in the Navy through the end of FY-92; and FASTPROM indicates whether a HR was advanced to HMC within 11 years. The effects of various background, demographic, and service-related variables on the dependent variables were measured. The results indicate that women, blacks, Hispanics, and HMs with certain NECs were more likely than white, male, general-duty HMs to stay in the Navy through FY-92; that HMs with certain NECs were more likely than other HMs to be advanced to HMC; and that there were no significant variables for predicting whether a HR would be advanced to HMC within 11 years.

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I. INTRODUCTION

A. BACKGROUND AND STUDY OBJECTIVES

The bulk of the people recruited into the enlisted ranks of the United States Navy are recruited into entry-level positions. These recruits enter the Navy at the lowest paygrade (denoted by the code E-1 for "enlisted, 1st rank ") and compete with their peers for advancement to higher ranks.[1] This policy of recruiting almost exclusively into the lowest rank creates a system where higher-ranked personnel have to be developed internally. As a result, some of the people recruited today will progress up through the ranks and will become the enlisted leaders of tomorrow's Navy.

In order to meet its need for personnel to fill senior enlisted positions, it is essential for the Navy that a portion of high quality recruits progress through the ranks, continue on past their initial enlistments into the career pipeline, and gain the experience and skills needed to fill more senior positions. One focus of this study is to analyze the demographic and background characteristics of a hospitalman recruit that significantly affect that person's rate of advancement to the rank of Hospital Corpsman Chief Petty Officer (HMC). The chief petty officer (CPO) rank was chosen because it represents a major milestone in the career of an enlisted Navy member, and the Hospital Corpsmen rating was chosen because it is one of the largest enlisted specialties in the Navy. This demographic and background information will be used to meet the primary objectives of this study: (a) to determine whether minorities and women have

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[1] While there is some lateral recruitment into the Navy where individuals enter at some paygrade higher than E-1, this is not the norm. Possible reasons why a person might enter the Navy at an advanced paygrade include possessing technical skills or education levels higher than the typical recruit, or entering for an extended contract to train in a highly technical or seriously undermanned field.

been equally represented in the advancement process to HMC, and (b) to determine whether hospital corpsmen who specialize in different fields within the Hospital Corps have different probabilities of advancement to HMC.

B. THE CHIEF PETTY OFFICER RANK AND THE HOSPITAL CORPS

Attaining the rank of CPO in the Navy is a significant event for the enlisted careerist. The CPO-selectee is said to be "entering into a time-honored position, held by a relative few, in which the faith of the U.S. Navy has been entrusted." [Ref. 1] The CPO is afforded a certain respect that is not common for similar ranked individuals in the other military services. For example, whereas individuals advanced to the rank of E-7 in the other services would wear the same uniform with an additional stripe on their rank insignia, a person advanced to CPO in the Navy begins wearing a new uniform that more closely resembles the uniform of a naval officer than that of an enlisted person. After advancement, CPOs can no longer wear the dungaree uniform worn by junior enlisted personnel and instead begin wearing the same khaki uniform worn by officers.

Beside the uniform change, CPO-selectees typically participate in a lengthy initiation which lasts from the time they are notified of their selection to CPO until the day that they are officially advanced to CPO (usually a period of several months). A secretive final initiation ceremony, organized and attended by the other CPOs at the command or in the community, typically takes place on the day the selectee is advanced. At the completion of the ceremony, the CPO-selectees are admitted into the community of CPOs and have gained the right to be called "Chief."

But what is more important than either the uniform change or the initiation rites that accompany advancement CPO is the institutional respect granted to the position. The CPO has a strong traditional role in the Navy and is viewed by the top Navy

leadership as being vital to the success of the organization. The importance of the CPO position to the Navy is demonstrated in part by the existence of the *Chief Petty Officer Indoctrination Course*. Completion of this three-day course, which covers topics such as communication skills, leadership skills, professionalism, and counseling, is required for all CPO selectees before they can be advanced in rank. The fact that CPO selectees must complete this additional requirement before being advanced is an acknowledgment by the Navy of the pivotal roles that CPOs play in the organization.

It is clear then that advancement to CPO in the Navy is more than just another step in a career pathway. To the new Chief and to the Navy, this advancement represents a transition from the working force to middle management, and it brings with it new-found respect. The CPO is expected to be "a technical expert, an administrator, a counselor, a teacher, and an organizer." [Ref. 1] But this new-found respect carries with it new responsibilities. Others in the Navy, whether they are superiors, subordinates, or peers, expect professional excellence from CPOs - an expectation that a new Chief may have not have experienced at the lower ranks.

Just as the rank of CPO has its unique characteristics, so too does the Hospital Corps. The Hospital Corps is the only enlisted "corps" in the Navy. Whereas "corps" are common in the officer structure (such as the Medical Corps, the Supply Corps, the Chaplain Corps), the Hospital Corps is unique in the enlisted structure. The reason for this distinction may be that the Hospital Corps, like the various officer corps, primarily provides support to the operational forces of the Navy. In essence, the Hospital Corps plays a "staff" role in the organization versus a "line" role.

Another unique characteristic of the Hospital Corps is that close to 17 percent of hospital corpsmen are assigned to Marine Corps commands rather than to Navy commands. [Ref. 2] The Marine Corps has no internal medical personnel so, as a component of the Department of the Navy, it receives its medical support from the Navy. Therefore, a hospital corpsman can find himself working in a wide variety of

environments. Typical tours of duty for hospital corpsmen include assignments to Navy hospitals or clinics, to Marine Corps infantry companies, to Navy and Marine Corps aviation squadrons, to Navy ships or submarines, to instructor positions, to Navy salvage and repair diving units, to Marine Corps reconnaissance platoons, and many others.

Within the Hospital Corps, hospital corpsmen have the opportunity to specialize in a wide variety of fields. Many of these specialty fields are similar to those found in the civilian medical community, such as the lab, x-ray, or physical therapy fields. But there are also a number of specialty fields open to hospital corpsmen that are unique to the Navy, such as diving medicine, sea-air-rescue, field (combat) medicine, undersea medicine, and others. Once a hospital corpsman decides to specialize in a particular field, he or she applies for and must be accepted to the C-school that provides that specialty training.[2] Medical C-schools are located throughout the country and vary in duration depending on the specialty. For example, the basic laboratory technician school is taught in Fort Sam Houston, Texas, and is 18 weeks in duration, whereas the preventive medicine technician course is taught in Oakland, California, over a 26 week period. Upon successful completion of a C-school, hospital corpsmen are awarded a Navy enlisted classification code (NEC) that identifies their area of specialization. There are currently 41 NECs, or areas of specialization, for hospital corpsmen in the Navy. Table 1 provides a list of hospital corpsman NECs and their titles [Ref. 3].

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[2] C-schools provide specialized training within a given field for enlisted members, as opposed to A-schools, which provide basic training within a field. For example, for a recruit to become a Hospital Corpsman, he must first attend Hospital Corpsman "A" School. For a Hospital Corpsman to become further specialized within the medical field, he would attend a "C" school.

NEC	TITLE
HM-8401	Search and Rescue Medical Technician
HM-8402	Submarine Force Independent Duty Corpsman
HM-8403	Special Amphibious Reconnaissance Independent Duty Corpsman
HM-8404	Medical Field Service Technician
HM-8406	Aerospace Medical Technician
HM-8407	Radiation Health Technician
HM-8408	Cardiovascular Technician
HM-8409	Aerospace Physiology Technician
HM-8416	Clinical Nuclear Medicine Technician
HM-8424	Advanced Medical Administration Technician
HM-8425	Surface Force Independent Duty Technician
HM-8427	Fleet Marine Force Reconnaissance Corpsman
HM-8432	Preventive Medicine Technician
HM-8434	Hemodialysis/Apherisis Technician
HM-8445	Ocular Technician
HM-8446	Otolaryngology Technician
HM-8451	Basic X-ray Technician
HM-8452	Advanced X-ray Technician
HM-8454	Electroneurodiagnostic Technician
HM-8463	Optician
HM-8466	Physical Therapy Technician
HM-8467	Occupational Therapy Technician
HM-8472	Biomedical Photography Technician

HM-8478	Advanced Biomedical Equipment Technician
HM-8479	Basic Biomedical Equipment Technician
HM-8482	Pharmacy Technician
HM-8483	Surgical Technologist
HM-8485	Psychiatry Technician
HM-8486	Urology Technician
HM-8489	Orthopedic Cast Room Technician
HM-8491	Special Operations Independent Duty Corpsman
HM-8492	Special Operations Technician
HM-8493	Medical Deep Sea Diving Technician
HM-8494	Deep Sea Diving Independent Duty Corpsman
HM-8495	Dermatology Technician
HM-8496	Mortician
HM-8501	Laboratory Technician Basic
HM-8503	Histopatholgy Technician
HM-8505	Cytology Technician
HM-8506	Medical Laboratory Technician Advanced
HM-8541	Respiratory Therapy Technician

Table 1. Hospital Corpsman Navy Enlisted Classification Codes (NECs). From Ref. 3.

C. ENLISTED ADVANCEMENT POLICIES AND EQUAL OPPORTUNITY POLICIES

Since this study focuses on the advancement cycle to HMC, with a particular emphasis on female and minority representation in the advancement cycle, an understanding of Navy enlisted advancement policies and equal opportunity policies would be useful.

1. Enlisted Advancement Policies

As noted in the introduction, most recruits enter the Navy at the rank of E-1. Recruits entering the Hospital Corps immediately upon enlistment would be designated a Hospitalman Recruit (HR) after completion of basic training (boot camp). Subsequent ranks and titles for hospital corpsmen are shown in Table 2.

Advancement to the ranks of E-2 and E-3 are non-competitive, and there are no numerical limitations on how many people can be advanced to these ranks.[3] Advancement to these paygrades is an administrative process. If a candidate has met

Rating/Rank Abbreviation	Title
HR (E-1)	Hospitalman Recruit
HA (E-2)	Hospitalman Apprentice
HN (E-3)	Hospitalman
HM3 (E-4)	Hospital Corpsman Third Class
HM2 (E-5)	Hospital Corpsman Second Class
HM1 (E-6)	Hospital Corpsman First Class
HMC (E-7)	Hospital Corpsman Chief
HMCS (E-8)	Hospital Corpsman Senior Chief
HMCM (E-9)	Hospital Corpsman Master Chief

Table 2. Hospital Corpsman Rank Structure.

time-in-service and time-in-rate requirements, is recommended for advancement by the commanding officer, and passes a locally administered examination (for advancement to E-3), he or she may be advanced to the next rank. [Ref. 4]

Advancement to the remaining ranks is a competitive process, and the number of people advanced is based on, and is limited by, vacancies within the system. In

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[3] The advancement policies described in this section generally apply to all ratings within the Navy and are not unique to the Hospital Corps.

addition to several other requirements (such as time-in-rate requirements, completion of the Personnel Advancement Requirements (PARs) checklist, passing the military leadership examination, etc.), candidates for advancement to E-4 through E-7 must take and pass a 150 question test related to their specific occupation. This examination is offered twice per year for E-4 through E-6 candidates, and once per year for E-7 candidates. Hospital corpsmen take an examination specific to the medical field, just as people in other ratings take examinations specific to their own fields. This Navywide advancement examination represents the major hurdle to advancement because, even though candidates may have successfully completed all other requirements for advancement, they cannot be advanced unless they pass the Navywide Advancement Examination. [Ref. 4]

Even passing the Navywide Advancement Examination is no guarantee that a candidate will be advanced. Advancement to E-4 through E-6 is based upon a candidate's "final multiple score" (FMS) and how that score compares to the scores of other candidates competing for advancement. Once a candidate's score on the Navywide Advancement Examination is known, a FMS is computed to rank the candidate against his or her peers. The Bureau of Naval Personnel (BUPERS) sets the FMS cut-off score, which varies depending upon Navywide vacancies in each occupational rating. Those candidates whose FMS exceed the cut-off score are advanced to the next higher paygrade. The factors used to compute the FMS and their definitions are shown in Table 3. [Ref. 4]

Advancement to the ranks of E-2 and E-3 are non-competitive, and there are no numerical limitations on how many people can be advanced to these ranks.[4] Advancement to these paygrades is an administrative process. If a candidate has met for E-7 candidates. The records of all SBE candidates are then reviewed by a selection

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[4] The advancement policies described in this section generally apply to all ratings within the Navy and are not unique to the Hospital Corps.

board convened annually by the Chief of Naval Personnel. The board is comprised of a Captain who serves as President, officers and master chief petty officers, and other officers and enlisted personnel who serve as Recorder and Assistant Recorders. The selection board ultimately decides who will be advanced to the rank of E-7 from all SBE candidates. [Ref. 4]

Advancement Paygrade	Final Multiple Score Factors					
E-4 - E-6	Standard Score	Performance Factor	Length of Service	Service in Paygrade	Awards	PNA Points
E-7	Standard Score	Performance Factor				

Table 3 Definitions.

Standard Score - the Standard Score Factor is derived from the person's standardized score on the Navywide Advancement Examination.

Performance Factor - the Performance Factor is derived by averaging performance marks from a person's enlisted performance evaluation over a specified timeframe.

Length of Service - the Length of Service Factor is derived by taking a person's total active military service time less service in paygrade time plus a constant value.

Service in Paygrade - the Service in Paygrade Factor is derived by taking twice a person's time of service in paygrade (to a maximum of 7 1/2 years) plus a constant value.

Awards - individuals get a certain number of points for each personal service award they have received. The Awards Factor is derived by summing all awards points.

PNA Points - when individuals pass the Navywide Advancement Examination with a relatively high score, but is not advanced in the cycle, they receive points that are credited to their FMS in subsequent advancement cycles. The PNA Point Factor is derived by summing all PNA points earned from previous advancement cycles up to set limits.

Table 3. Final Multiple Score Factors by Advancement Paygrade. From Ref. 4.

2. Equal Opportunity Policies

The Navy's policy on equal opportunity is clearly spelled out by the Secretary of the Navy. Per Navy directives:

Equal opportunity and treatment shall be provided to all military members and civilian employees of the Department of Defense irrespective of their race, color,

religion, age, national origin, or gender consistent with requirements for physical capabilities. [Ref. 5]

In addition to its equal opportunity policy, the Navy has adopted an affirmative action plan. Affirmative actions are defined as actions that "are specific, positive steps to correct or eliminate institutional and personal discrimination on the basis of race, ethnic group, national origin, religion, or gender." Although the Navy has set specific numerical goals for certain minority groups or for females in areas such as officer accessions, enlisted recruiting, and force composition, there is no policy which sets specific advancement numbers for minorities and females. For example, one Navy affirmative action goal is to "commission a minimum of seven percent Black and four percent Hispanic officers annually from each accession source." However, the affirmative action goal regarding advancement is less definite and states that the Navy will "monitor and assess promotion and advancement data and identify any significant differences in promotion or advancement opportunities for minorities or women." This monitoring and assessment of promotion and advancement statistics is done to provide "senior Navy leadership with the indicators necessary to ensure equity for all Navy personnel." [Ref. 6]

D. HYPOTHESIS STATEMENTS

In theory, only the highest-quality sailors who have demonstrated their ability to perform well and take on the responsibility of the next higher rank are advanced, and only the most exceptional sailors are advanced at the first opportunity.

With "sustained superior performance" serving as the primary criterion for advancement to CPO [Ref. 4], and given the Navy's stance on equal opportunity, minority status should not be an issue in advancement. BUPERS policy states that,

While it cannot be assured that any one person will be advanced, it is guaranteed that all enlisted personnel of a particular rating and similar qualifications

will have equal opportunity to compete for advancement. [Ref. 4]

However, gender *can* be a barrier to advancement. As BUPERS notes, "As a result of Title 10 (USC) prohibiting women from combat billets, it may be necessary to limit the number of women being advanced relative to men within selected ratings." [Ref. 4] Modeling the background and demographic characteristics that affect a hospitalman recruit's rate of advancement through the ranks allows the effects of gender and minority status in the advancement process to be measured. This information would be valuable to senior medical department personnel in their efforts to assess and ensure equal opportunities within the medical department.

Similarly, since Navy policy is to advance based on vacancies within each *rating*, and not the more narrow NEC category, a person's NEC should not be a factor in the advancement process. In other words, people of equal quality and with similar qualifications within the Hospital Corps should have equal advancement probabilities regardless of their NECs. Advancement opportunities within the enlisted ranks are set by the Chief of Naval Personnel, subject to limitations set by the Secretary of Defense and by the Chief of Naval Operations. Advancement opportunities are "based on the vacancies that exist in each rating within the authorized petty officer ceiling and requirements." By isolating the effects of NECs on advancement to HMC, an assessment as to whether Navy policy regarding advancement, as outlined in BUPERS directives, is being adhered to, or whether NECs have indeed had an influence on the advancement process to HMC. [Ref. 4]

Because of the Navy's policy on equal opportunity, and the assertion that NECs should not influence a hospital corpsman's chances for advancement to HMC, the following hypothesis statements will be tested and are expected to be accepted.

1. Women from the 1979 cohort of Navy recruits who entered the Hospital Corps and remained in the Navy for subsequent enlistments have had probabilities of being advanced to HMC that are equal to their male peers.

2. People of minority status from the 1979 cohort of Navy recruits who entered the Hospital Corps and remained in the Navy for subsequent enlistments have had probabilities of being advanced to HMC that are equal to their non-minority peers.

3. People from the 1979 cohort of Navy recruits who entered the Hospital Corps and remained in the Navy for subsequent enlistments have had equal probabilities of being advanced to HMC regardless of the NEC they possess.

II. LITERATURE REVIEW

While retention and attrition have been favored topics of military manpower researchers, promotion studies have been limited. One of the most in-depth studies focusing on promotion tempo was conducted by Buddin, Levy, Hanley, and Waldman [Ref. 7]. Studying data on cohorts of Army and Air Force recruits for the fiscal years 1984 through 1989, they used maximum likelihood "logit" regression techniques to model the effects of certain characteristics on a soldier's or airman's rate of promotion to E-5, as well as the effects of their expected time to promotion to E-5 on retention past the first enlistment. The results were not surprising in that those soldiers and airmen with higher Armed Forces Qualification Test (AFQT) scores, higher educational levels, and faster promotion times to E-4 tended to have faster rates of promotion to E-5.[5] In the Army, where various occupational groups have various promotion opportunities, they found wide variations in E-5 promotion tempos across occupational groups. Finally, when individuals had a higher expectation of being promoted to E-5, their retention rates tended to be higher. The portion of this study focusing on the Army is most applicable to a Navy promotion study since the promotion systems are very similar. In the Army and the Navy, unlike in the Air Force, advancement opportunities vary according to occupational specialty. [Ref. 7]

The Buddin, et. al., study was restricted to males only, so any effects of gender on promotion tempo to E-5 or on retention could not be measured. The study, however, did measure the effects of minority status on retention past the initial enlistment contract (i.e., reenlistment). In the Army, blacks with a given expectation of promotion to E-5 had reenlistment rates that were 9 percent higher than whites after controlling for other factors. Hispanic reenlistment rates were not significantly different than those of whites. In the Air Force, blacks with a given expectation of

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[5] See Appendix A for an explanation of AFQT scores.

promotion to E-5 again had higher reenlistment rates (2 percent higher) when controlling for other factors, whereas Hispanic reenlistment rates were not significantly different than those of whites after controlling for other factors. [Ref. 7]

Even though pure promotion studies are limited, the findings of retention and attrition studies nevertheless have theoretical applications to promotion studies. These studies have typically measured the effects of certain demographic and background characteristics on the likelihood that a recruit will either attrite from the military before the completion of their initial contract, or on the likelihood that a recruit will reenlist for a second term. Not attriting and reenlisting are viewed as being beneficial to the military and so, in theory, serve as a measure of *success* in the military.

For example, Cooke and Quester defined success for a Navy recruit as (a) completing the initial contract; (b) attaining the rank of E-4 in the first term; and (c) reenlisting for another term [Ref. 8]. Their study, which merged an administrative data set from the Naval Recruiting Command (which contains information about a recruit before he or she enters the Navy) with the Enlisted Master Record File (which records a recruit's service history) for the fiscal years 1978 through 1982 Navy enlisted cohorts, again demonstrated the influence of variables which serve as measures of quality (i.e., AFQT scores and high school diplomas) on the likelihood that recruits from their sample would be successful. For example, they showed that, all other things being equal, high school graduates in the Armed Forces Mental Group (AFMG) I through IIIA who immediately enlist into the non-specialized general detail have a 68 percent probability of completing their enlistment; a 55 percent probability of completing their enlistment as an E-4; and a 34 percent probability of staying beyond their initial enlistment versus 37 percent, 25 percent, and 20 percent probabilities, respectively, for similar nongraduate recruits in the category IIIB or IV AFMG. While this study was also restricted to males, it did reveal that black and Hispanic males from their study group tended to be more successful (using their definitions of success) than

their non-black, non-Hispanic peers. For example, while blacks and Hispanic represented 17.0 and 4.0 percent of the recruit population, they represented 22 and 4.3 percent of the population that progressed past the initial contract period. [Ref. 8]

Numerous other studies have demonstrated the relationship between high school diplomas, AFQT scores, and success in the military, regardless of whether success is measured in terms of attrition, retention, or productivity. For example, Buddin showed that when looking at the services overall, non-high school graduates have early attrition rates that are 8.08 percentage points higher than high school graduates, while early attrition decreases by one percentage point for each increase of 12.5 percentage points in the AFQT percentile scores [Ref. 9].[6] This study, too, was restricted to males, but it showed that blacks and Hispanics again tended to be more successful (in terms of their attrition behavior) than their non-black, non-Hispanic counterparts. Here, blacks and Hispanics had attrition rates about 4 percentage points lower than white, non-Hispanics when controlling for other factors. [Ref. 9]

Similarly, Nakada showed that, with other things being equal, those sailors with 12 years of education have probabilities of exiting the Navy after their first term that are 25 percentage points lower than those with less than 12 years of education, and those in AFMGs I through IIIA have exit probabilities that are 26 percentage points lower than those in AFMGs IIIB through V.[7] [Ref. 10].

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[6] Buddin used a data set that matched the results of the *1979 Survey of Personnel Entering Active Duty* with longitudinal personnel records for the survey respondents maintained by the Defense Manpower Data Center. The merged set tracked survey respondents from the point of enlistment in 1979, through their assession, to September 1982 or until attrition. The original data set contained 12,063 observations for recruits entering all four services, but restrictions (including the elimination of females) reduced the set to 8690 observations. Early attrition is defined as attrition within the first six months after assession. [Ref. 9]

[7] Nakada examined the fiscal year 1978 cohort of male Navy enlistees and tracked their behavior for 20 quarters through the end of fiscal year 1982. His study used the Cox

Finally, Marcus and Quester showed consistently positive relationships between the possession of a high school diploma, AFQT scores, and the productivity of first-term sailors as assessed through supervisor surveys [Ref. 11].[8] However, no attempt was made in this study to isolate the possible effects of either gender or minority status on productivity.

Since completing the initial contract and reenlisting past the first-term are viewed as being beneficial to the Navy and, therefore, represent measures of success in the military, so too does promotion. People who are promoted are theoretically prepared for increased responsibility because their knowledge, skills, and abilities have surpassed those of their non-promoted peers. In essence, they have become more productive and beneficial to the Navy and, as Cymrot notes, they have been more productive in the past [Ref 12]. Clearly, those people in the Navy who are promoted are successful, and those who promote the fastest are the most successful.

With attrition, retention, and promotion all serving as measures of success in the Navy, then it is reasonable to expect that those variables that influence whether a person is successful in terms of attrition and retention behavior will also apply to successful promotion behavior. It is for this reason that many attrition and retention

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regression model and, although it focused primarily on the effects of sea duty on retention behavior, it nevertheless revealed the relationship between education and ability on retention, a measure of success in the military. [Ref. 10]

[8] This study used data from the Rand Corporation's Enlisted Utilization Survey which contained 7,110 surveys returned from supervisors of first-term Navy enlistees. The surveys focused on the productivity of the enlistees at various points in their enlistment. Using ordinary least squares regression techniques, Marcus and Quester measured the productivity of first-term sailors against the productivity of the average specialist within the same occupation after four years at the duty station. While the effects of high school diplomas on productivity were generally positive and significant across the various occupational groups, AFQT scores were more frequently insignificant, although this is common when high school diploma and AFQT score variables are measured simultaneously. [Ref. 11]

studies have theoretical applications to a promotion study such as this one, even though they may not focus on promotion behavior per se. The hypothesized relationships between those variables other than education and AFQT scores that will comprise the promotion model developed in this study will be discussed in the next section.

Some studies have been done that focus specifically on the performance of hospital corpsmen. For example, Goffman followed 1,315 hospital corpsmen who graduated from Hospital Corps School in San Diego, California, between November 1966 and August 1967 [Ref. 13]. He combined cognitive and demographic variables pertaining to each graduating hospital corpsman to develop a predictor of succesful performance on the job. At the time of their discharge from the service, each of the 1,315 hospital corpsmen were designated as being either successful or unsuccessful in their initial tours of duty. Those hospital corpsmen discharged prematurely from the Navy for adverse reasons, and those who were not recommended for reenlistment, were considered unsuccessful, whereas those hospital corpsmen who completed their tours of obligated service and who were recommended for reenlistment were considered successful. Using multiple regression techniques, Goffman found that by combining certain demographic variables and other cognitive variables with those variables traditionally used as selection criteria for Hospital Corpsman "A" School (namely, the person's General Classification Test and Arithmetic Test scores derived from the Armed Services Vocational Aptitude Battery score), a useful predictor of a hospital corpsman's success in the Navy was created. Goffman found that a person's General Classification Test score and education levels prior to entering the service were the variables most valid for predicting on-the-job performance. [Ref. 13]

Another study focusing on hospital corpsmen was performed by Webster and Booth [Ref. 14]. This study is pertinent since it looked specifically at differences in behavior between men and women in the Hospital Corps. Using survey information, Comrey Personality Scales, and service record data for 3301 hospital corpsmen (2747

males and 554 females) who entered training between February and August 1973, they found no significant difference between the percentage of men and women completing Hospital Corps school. They also found that 94 percent of the men completing Hospital Corps School were still on active duty after one year, as were 93 percent of the women. A significant difference in the behavior of men and women did arise for those people who were disenrolled from Hospital Corps School, and who were subsequently sent to the fleet. Here, only 63 percent of the males remained on active duty after one year, whereas 72 percent of the females did. Women from the sample were also better educated, had fewer disciplinary problems in the past, were more certain about their career choice, and were better informed about career choice than were men from the sample. [Ref. 14]

III. DATA, SAMPLES, AND THE ADVANCEMENT MODELS

A. THE DATA

Every three years since 1979, the Navy has collected a range of data on all enlisted personnel entering the Navy. The data for this study came from a data set that contains merged information from the Military Entrance Processing Command (MEPCOM) edit file, the enlisted master loss file, and the active duty master file on five cohorts entering the Navy in fiscal years 1979, 1982, 1985, 1988, and 1990. In each of these years, a large amount of background, demographic, health, and miscellaneous information (the MEPCOM edit file) was obtained on each cohort upon its entry into the Navy. Then, at the end of each fiscal year that the individual in the data set remained in the Navy, up through the end of fiscal year 1992, data for fourteen additional variables were collected (the active duty master file). For those individuals who attrited from the service or who left the Navy at the end of their contractual obligations, an additional set of data was collected (the enlisted master loss file). The merging of the MEPCOM edit file with the active duty master file creates a longitudinal file of a recruit's service history that made the modelling of advancement rates to HMC possible.

This study was restricted to the cohort data set for fiscal year 1979. Therefore, for people enlisting in the Navy in fiscal year 1979, the data set contains fourteen years of follow-up data taken from the active duty master file. Those individuals from the cohort who separated from the service before fiscal year 1992 were not deleted from the data set; rather, the fourteen variable values for each year after separation are coded with zeros for numerical data or are left blank for character data. The only data used from the enlisted master loss file were NEC data. The NEC data were used to identify the specialties of those hospital corpsmen who separated from the Navy.

B. THE SAMPLE

The sample for this study was limited to only those individuals from the FY-79 cohort who entered the Hospital Corps. It was further restricted to only those personnel who entered the Navy at the rank of E-1. After imposing the rank restriction and several other restrictions, the number of observations in the sample was reduced from 2798 to 1834. Most other restrictions were imposed to eliminate observations in the data that had missing or unknown values for the hypothesized variables comprising the advancement models; inclusion of these observations would have made accurately assessing the influence of these variables impossible. For example, if an individual's AFMG was recorded as zero (meaning unknown), then the observation was deleted from the data set. Other restrictions were imposed to eliminate observations for which there was a theoretical reason to believe that the observations were not homogenous with the rest of the observations. This was the case for those enlistees who had prior military service and those who entered the Navy at some rank higher than E-1. Other restrictions were imposed to eliminate observations for which there was a clear basis to believe that the data were erroneous, such as an entry year and month indicating an individual entered at some time other than between October 1978 and September 1979 (since personnel in the fiscal year 1979 cohort could only have entered during this timeframe).

C. THE MODELS

This study uses three models to analyze the influence of various background, demographic, and service history variables on the advancement process to HMC. All models were written and processed using *SAS System* software by the SAS Institute. Descriptions of the three models, which were developed in order to analyze the

advancement process from a variety of perspectives, are as follows:

1. The first model, entitled *STAYEDIN*, uses maximum likelihood logit techniques to measure how changes in the values of the independent variables change the log of the odds that a person will stay in the Navy for the 14 year period being studied. This model is useful for identifying the characteristics of an individual who is likely to remain in the Navy for a period that is long enough to allow for advancement to HMC.

2. The second model, entitled *MADEHMC*, uses maximum likelihood logit techniques to measure how changes in the values of the independent variables change the log of the odds that an individual from the 1979 cohort will ultimately be promoted to HMC. This is the primary model for the study.

3. The third model, entitled *FASTPROM,* is restricted to only those individuals who were promoted to HMC. This model uses maximum likelihood logit techniques to measure how changes in the independent variable values change the log of the odds that a person classified as an "early candidate" by the Bureau of Personnel, meaning the person has less than 11 years time in service, will be promoted to HMC [Ref. 4]. This model is useful for identifying the characteristics of a person who is likely to be promoted quickly to HMC.

Several variations of the three major models described above were created. In some cases, certain variables were eliminated from the major model if they proved to be insignificant, as measured by the Wald Chi Square statistic, creating a restricted version of the major model. In other cases, a "notional person" array was created to measure how changes in the characteristics of the notional person change the notional person's probability of staying in the Navy for the 14 year period, of making HMC, or of being promoted quickly to HMC.

The following is a list and a description of the dependent variables used in the three models:

1. **MADEHMC** is the binary, dependent variable for the *MADEHMC* model that denotes whether an individual was advanced to HMC. For those individuals who made HMC, the variable value is zero; for those individuals who did not, the variable value is one.

2. **STAYEDIN** is the binary, dependent variable for the *STAYEDIN* model that denotes whether an individual remained in the Navy for the entire fourteen year period under study. For those individuals who stayed in the Navy for the full 14-year period under study, the variable value is zero; for those individuals who did not, the variable value is one.

3. **FASTPROM** is the binary, dependent variable for the *FASTPROM* model denotes whether a person was promoted to HMC in 11 years or less. For those individuals who were advanced to HMC in 11 years or less, the variable value is zero; for those individuals who were not, the variable value is one.

The following is a list of the independent variables used for the models and the hypothetical reasons for their inclusion. For the purpose of this study, staying in the military, making HMC, and promoting quickly to HMC serve as measures of success, so those things which hypothetically improve a recruit's quality, such as high AFQT scores or attending college, are expected to increase a recruit's likelihood of staying in the military, making HMC, and promoting quickly to HMC.

1. **TEEN.** This variable was included to measure whether teenage recruits behave differently from older recruits. Because of opposing, yet reasonable, theories regarding the influence of age on military success, this variable is expected to neither positively nor negatively affect the *MADEHMC, STAYEDIN*, or *FASTPROM* variable values. In one theory, Buddin suggests that older individuals entering the military may be "labor market 'lemons'" from the older civilian populations [Ref. 9]." If this is true, younger recruits are expected to perform better than older recruits, so the expected sign of the TEEN variable coefficient in the *MADEHMC, STAYEDIN* and

FASTPROM models is positive. However, Buddin also points out that previous studies by Mincer and Jovanovic (1982) and by Mobley, et. al. (1979) "reveal a decline in civilian separations as an individual grows older [Ref. 9]." Since military recruits come from the civilian population, it is reasonable to assume that the positive relationship between age and job stability would carry over to the military. Applying this theory, the expected coefficient of the TEEN variable is negative in the *MADEHMC, STAYEDIN,* and *FASTPROM* models. The test of significance for this parameter is two-tailed. For those individuals who are teenagers, the variable value is one; for those individuals who are not, the variable value is zero.

2. **HISPANIC.** This variable was included to measure whether Hispanics behave differently from non-Hispanic whites, and to check for trends indicating possible institutional discrimination against Hispanics. Assuming the Navy is an equal-opportunity organization, this variable is expected to neither positively nor negatively affect the *MADEHMC*, *STAYEDIN*, and *FASTPROM* variable values. The test of significance for this parameter is two-tailed. For those individuals who are Hispanic, the variable value is one; for those individuals who are not, the variable value is zero.

3. **BLACK.** This variable was included to measure whether blacks behave differently from whites, and to check for trends indicating possible institutional discrimination against blacks. Assuming the Navy is an equal-opportunity organization, this variable is expected to neither positively nor negatively affect the *MADEHMC*, *STAYEDIN*, and *FASTPROM* variable values. The test of significance for this parameter is two-tailed. For those individuals who are black, the variable value is one; for those individuals who are not, the variable value is zero.

4. **HIGHAFQT.** This variable was included to measure whether individuals with AFQT scores in the upper percentiles behave differently from individuals with lower AFQT scores. This variable is expected to increase the *MADEHMC*, *STAYEDIN*, and *FASTPROM* variable values. The test of significance for this

parameter is an upper-tailed test. For those individuals in category I or II of the Armed Forces Mental Groups, the variable value is one; for those individuals who are not, the variable value is zero.

5. **DPNDENTS.** This variable was included to measure whether individuals who are married, or who have dependents, behave differently from single individuals with no dependents. This variable is expected to neither positively nor negatively affect the *MADEHMC*, *STAYEDIN*, or *FASTPROM* variable values. However, in their study of attrition from the Army's Delayed Entry Program (DEP), Kearl and Nelson demonstrated that individuals with dependents had "DEP loss rates at least ten percentage points lower than those with no family responsibilities [Ref. 15]." If this behavior carries over active military service, then it is reasonable to infer that this variable may increase the value of the *STAYEDIN* variable. The test of significance for this parameter is a two-tailed test. For those individuals who are married, or who have dependents, the variable value is one; for those individuals who do not, the variable value is zero.

6. **DIPLOMA.** This variable was included to measure whether high school graduates behave differently from non-high school graduates. This variable is expected to increase *MADEHMC, STAYEDIN*, and *FASTPROM* variable values. The test of significance for this parameter is an upper-tailed test. For those individuals who obtained a high school diploma, the variable value is one; for those individuals who did not, the variable value is zero.

7. **SOMECOLL.** This variable was included to measure whether recruits with some college education behave differently from recruits without any college education. This variable is expected to increase *MADEHMC, STAYEDIN*, and *FASTPROM* variable values. The test of significance for this parameter is an upper-tailed test. For those individuals with some college credits, the variable value is one; for those individuals without any college credit, the variable value is zero.

8. **COLLDEG.** This variable was included to measure whether recruits with college degrees behave differently than recruits without a college degree. This variable is expected to increase *MADEHMC, STAYEDIN*, and *FASTPROM* variable values. The test of significance for this parameter is an upper-tailed test. For those individuals with college degrees, the variable value is one; for those individuals without a college degree, the variable value is zero.

9. **WENTCOLL.** This variable was included to measure whether recruits who attended college while in the military behave differently from recruits who did not attend college while in the military. This variable is expected to increase *MADEHMC, STAYEDIN,* and *FASTPROM* variable values. The test of significance for this parameter is an upper-tailed test. For those individuals who attended college while in the military, the variable value is one; for those individuals who did not, the variable value is zero.

10. **FEMALE.** This variable was included to measure whether females behave differently from males, and to check for trends indicating possible institutional discrimination against females. Assuming the Navy is an equal-opportunity organization, this variable is expected to neither positively nor negatively affect the *MADEHMC*, *STAYEDIN*, and *FASTPROM* variables values. The test of significance for this parameter is two-tailed. For those individuals who are female, the variable value is one; for those individuals who are not, the variable value is zero.

11. **NEC.** There are 37 separate variables for each of 37 different hospital corpman NECs represented in the data set. They were included to measure whether hospital corpsmen who receive different specialty training while in the Navy behave differently from general duty hospital corpsmen. Because Navy policy is to promote to vacancies within Navy ratings, and not the more narrow NEC category, these variables are expected to neither positively nor negatively affect the *MADEHMC, STAYEDIN*, or *FASTPROM* variable values. The test of significance for these variables is two-tailed.

For those individuals who attained the NEC denoted by the variable, the variable value is one; for those individuals who did not, the variable value is zero.

IV. MODEL RESULTS

A. PRELIMINARY DATA ANALYSIS

Table 4 provides descriptive statistics information for the continuous variables and frequency tables for other select variables. This information describes the characteristics of the entering cohort of hospitalman recruits. The "average" hospitalman recruit from the 1979 cohort is a white, male, high school graduate who entered the Navy at the age of 19. He falls within category IIIa of the Armed Forces Mental Groups (50th - 64th percentile: mean=53%), does not possess a college degree, and he has not attended college. He is single and has no dependents. By the end of fiscal year 1992, the average length of time-in-service for all individuals from the FY-79 cohort is just less than 74 months. Those individuals from the cohort who were promoted to HMC were promoted after an average length of time-in-service of about 124 months.

CONTINUOUS VARIABLE DESCRIPTIVE STATISTICS:

Variable	N	Mean	Std Dev	Minimum	Maximum
ENTRY AGE	1834	19.3773173	2.3278593	17.0000000	31.0000000
AFQT PERCENTILE	1834	53.0294438	20.5029027	4.0000000	99.0000000
TIME IN SERVICE	1834	73.7584515	47.4630933	1.0000000	168.0000000
TIME IN SERVICE TO HMC	69	124.2608696	20.4656471	88.0000000	171.0000000

SELECTED VARIABLE FREQUENCIES:

Variable: ENTRY AGE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
17	240	13.1	240	13.1
18	596	32.5	836	45.6
19	407	22.2	1243	67.8
20	215	11.7	1458	79.5
21	112	6.1	1570	85.6
22	82	4.5	1652	90.1
23	59	3.2	1711	93.3
24	36	2.0	1747	95.3
25	33	1.8	1780	97.1
26	17	0.9	797	98.0
27	10	0.5	1807	98.5
28	13	0.7	1820	99.2
29	4	0.2	1824	99.5
30	7	0.4	1831	99.8
31	3	0.2	1834	100.0
RACE				
WHITE	1356	73.9	1356	73.9
HISPANIC	402	21.9	1758	95.9
BLACK	76	4.1	1834	100.0
SEX				
MALE	1401	76.4	1401	76.4
FEMALE	433	23.6	1834	100.0
DEPENDENTS-MARITAL STATUS				
SINGLE-0 DEPS.	1743	95.0	1743	95.0
SINGLE-1 DEP	7	0.4	1750	95.4
SINGLE-2 DEPS.	1	0.1	1751	95.5
MARRIED-0 DEPS.	53	2.9	1804	98.4
MARRIED-1 DEP.	18	1.0	1822	99.3
MARRIED-2 DEPS.	10	0.5	1832	99.9
MARRIED-3 DEPS.	2	0.1	1834	100.0

Variable: HIGHEST YEAR OF EDUCATION	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	5	0.3	5	0.3
3	28	1.5	33	1.8
4	58	3.2	91	5.0
5	137	7.5	228	12.4
6	1412	77.0	1640	89.4
7	46	2.5	1686	91.9
8	15	0.8	1701	92.7
9	7	0.4	1708	93.1
10	6	0.3	1714	93.5
13	120	6.5	1834	100.0

Key: 2: 8 years; 3: 1 year high school; 4: 2 years high school; 5: 3 to 4 years high school - no diploma; 6: high school diploma; 7: 1 year college; 8: 2 years college; 9: 3 to 4 years college; 10: college graduate; 13: high school G.E.D.

Table 4. Descriptive Statistics for the Fiscal Year 1979 Cohort of Hospitalman Recruits.

Table 5 provides descriptive statistics describing the FY-79 cohort as it appeared at the end of FY-92. By the end of FY-92, 1,523 (83%) of the original 1,834 individuals in the FY-79 cohort had left the Navy. Of the 311 who remained, 56 (3.1%) were HMCs, while one had progressed to the rank of HMCS. Of the 311 individuals, 82% were high school graduates; 96% were single, without dependents; 23% were females, about 8% were black, and 27% were Hispanic.

Variable: PAYGRADE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
LEFT NAVY	1523	83.0	1523	83.0
E-4	2	0.1	1525	83.2
E-5	72	3.9	1597	87.1
E-6	180	9.8	1777	96.9
E-7	56	3.1	1833	99.9
E-8	1	0.1	1834	100.0

Variable: RACE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
LEFT NAVY	1523	83.0	1523	83.0
WHITE	202	11.0	1725	94.0
HISPANIC	85	4.7	1810	98.7
BLACK	24	1.3	1834	100.0
SEX				
LEFT NAVY	1523	83.0	1523	83.0
MALE	248	13.5	1771	96.5
FEMALE	63	3.5	1834	100.0
DEPENDENTS-MARITAL STATUS				
LEFT NAVY	1523	83.0	1523	83.0
SINGLE-0 DEPS.	299	16.3	1822	99.3
SINGLE-1 DEP.	1	0.0	1823	99.3
SINGLE-2 DEPS.	1	0.0	1824	99.3
MARRIED-0 DEPS.	7	2.9	1804	98.4
MARRIED-1 DEP.	18	1.0	1822	99.4
MARRIED-2 DEPS.	10	0.5	1832	99.9
MARRIED-3 DEPS.	2	0.1	1834	100.0
HIGHEST YEAR OF EDUCATION				
LEFT NAVY	1523	83.0	1523	83.0
2	0	0.0	1523	83.0
3	2	0.0	1525	83.2
4	6	0.0	1531	83.5
5	20	0.1	1551	84.6
6	256	14.0	1807	98.5
7	9	0.1	1816	99.0
8	5	0.0	1821	99.3
9	2	0.0	1823	99.4
10	2	0.0	1825	99.5
13	9	0.1	1834	100.0

Key: 2: 8 years; 3: 1 year high school; 4: 2 years high school; 5: 3 to 4 years high school - no diploma; 6: high school diploma; 7: 1 year college; 8: 2 years college; 9: 3 to 4 years college; 10: college graduate; 13: high school G.E.D.

Variable: ARMED FORCES MENTAL GROUPS	Frequency	Percent	Cumulative Frequency.	Cumulative Percent
LEFT NAVY	1523	83.0	1523	83.0
CAT. V	1	0.0	1524	83.1
CAT. IVc	7	0.0	1531	83.5
CAT. IVb	8	0.0	1539	84.0
CAT. IVa	43	2.3	1582	86.3
CAT. IIIb	97	5.3	1679	91.6
CAT. IIIa	60	3.3	1739	94.8
CAT. II	80	4.4	1819	99.2
CAT. I	15	0.1	1834	100.0

Table 5. Descriptive Statistics for Hospitalman Recruits From the FY-79 Cohort Remaining in the Navy at the End of FY-92.

B. *MADEHMC* MODEL RESULTS

Perhaps the best use of the *MADEHMC* model is for predicting the proportion of an entering cohort of hospitalman recruits who will *not* make HMC, versus those who will. This is apparent by the finding that, between FY-79 and FY-92, only about 3.8% (N=69) of the original cohort had progressed to the rank of HMC, while some 83% had actually left the Navy or the Hospital Corps by the end of FY-92. The finding that about 96% of the entering cohort of hospitalman recruits did not make HMC within the study period leaves only a small margin for predicting who *will* make HMC. Despite this small margin for predictive improvement, some variables included in the *MADEHMC* model were significantly related (at a 95% confidence interval) to the likelihood that a hospitalman recruit from the FY-79 would be promoted to HMC. Table 6 shows the restricted *MADEHMC* model specification and the statistics that resulted when it was applied to the FY-79 cohort of hospitalman recruits. This model is restricted in the sense that those variables that were not of primary concern in

Ordered Value	MADEHMC	Count
1	0	69
2	1	1765

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	590.031	489.882	.
SC	595.546	721.480	.
-2 LOG L	588.031	405.882	182.150 with 41 DF (p=0.0001)
Score	.	.	573.629 with 41 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-3.8315	0.2997	163.4388	0.0001	.	0.022
HISPANIC	1	-0.0252	0.3450	0.0053	0.9418	-0.005747	0.975
BLACK	1	0.6433	0.5511	1.3625	0.2431	0.070703	1.903
FEMALE	1	0.3078	0.3560	0.7473	0.3873	0.072082	1.360
N8201	1	-0.3655	6.7171	0.0030	0.9566	-0.004705	0.694
N8294	1	-0.0577	3.8858	0.0002	0.9882	-0.001286	0.944
N8401	1	3.1171	1.0502	8.8099	0.0030	0.080193	22.581
N8402	1	3.1243	2.9872	1.0938	0.2956	0.14545	22.743
N8404	1	0.3590	0.3788	0.8983	0.3432	0.089799	1.432
N8406	1	0.8547	0.6933	1.5198	0.2176	0.078232	2.351
N8408	1	-0.2150	3.3526	0.0041	0.9489	-0.005532	0.807
N8409	1	-0.0535	2.7549	0.0004	0.9845	-0.001686	0.948
N8416	1	-0.0577	4.7544	0.0001	0.9903	-0.001050	0.944
N8425	1	3.5517	1.6454	4.6594	0.0309	0.279005	34.873
N8432	1	1.4275	0.7004	4.1546	0.0415	0.098210	4.168
N8433	1	-0.3571	3.8862	0.0084	0.9268	-0.007959	0.700
N8444	1	-0.2101	1.7360	0.0147	0.9036	-0.010438	0.810
N8445	1	-0.0451	3.3691	0.0002	0.9893	-0.001161	0.956
N8446	1	-0.1069	2.7457	0.0015	0.9689	-0.003368	0.899
N8451	1	-0.1338	1.1923	0.0126	0.9106	-0.009811	0.875
N8452	1	0.4409	1.0146	0.1888	0.6639	0.030843	1.554
N8454	1	-0.0451	3.3691	0.0002	0.9893	-0.001161	0.956
N8463	1	-0.0535	1.9589	0.0007	0.9782	-0.002380	0.948
N8466	1	-0.1988	2.0300	0.0096	0.9220	-0.008467	0.820
N8472	1	-0.1374	3.3558	0.0017	0.9673	-0.003534	0.872
N8477	1	-0.0577	4.7544	0.0001	0.9903	-0.001050	0.944
N8478	1	1.1121	1.1724	0.8998	0.3428	0.051450	3.041
N8479	1	-0.0577	6.7171	0.0001	0.9931	-0.000743	0.944
N8482	1	-0.1698	0.8645	0.0386	0.8443	-0.017311	0.844
N8483	1	0.0319	0.7051	0.0021	0.9639	0.003743	1.032
N8485	1	-0.1746	1.0673	0.0268	0.8701	-0.014231	0.840

N8486	1	-0.2085	3.3531	0.0039	0.9504	-0.005363	0.812
N8489	1	-0.1714	1.5489	0.0122	0.9119	-0.009569	0.843
N8491	1	14.0046	107.5	0.0170	0.8963	0.254905	999.000
N8492	1	-0.0577	2.5539	0.0005	0.9820	-0.001962	0.944
N8493	1	5.1406	1.2998	15.6414	0.0001	0.147819	170.810
N8495	1	-0.1793	2.9996	0.0036	0.9523	-0.005157	0.836
N8501	1	-0.2697	1.4402	0.0351	0.8515	-0.016190	0.764
N8503	1	-0.3655	6.7171	0.0030	0.9566	-0.004705	0.694
N8506	1	1.0458	0.6976	2.2474	0.1338	0.080006	2.846
N8541	1	-0.1858	2.5389	0.0054	0.9417	-0.006318	0.830
N8703	1	-0.0577	6.7171	0.0001	0.9931	-0.000743	0.944

Association of Predicted Probabilities and Observed Responses

Concordant = 84.5%	Somers' D = 0.750
Discordant = 9.5%	Gamma = 0.798
Tied = 6.1%	Tau-a = 0.054
(121785 pairs)	c = 0.875

Table 6. Restricted *MADEHMC* Model Results.

this study (i.e., any variables other than race, sex, or NECs) were deleted from the full *MADEHMC* model if they were insignificant, as measured by the Wald Chi-square statistic. Appendix B shows the results of the full *MADEHMC* model.

A comparison of Table 6 and Appendix B reveals that the TEEN, HIGHAFQT, DPNDENTS, DIPLOMA, SOMECOLL, COLLDEG, and WENTCOLL variables were deleted, because of insignificance, from the full *MADEHMC* model to create the restricted *MADEHMC* model. The remaining variables in the restricted model, as shown in Table 6, were retained because they are a primary focus of this study. The HISPANIC, BLACK, and FEMALE variables were all insignificant. Of the NEC variables, only the 8401, 8425, 8432, and 8493 were found to be significant. The model concordance of 84.5% indicates that the explanatory variables are predicting 84.5% of the variation in the dependent variable value.

To assess the changes in the probability of making HMC associated with the significant variables from the restricted *MADEHMC* model results, a "notional person" variation of the restricted *MADEHMC* model was created. This model measures the

change in the probability of making HMC, as compared to the notional person, as each of the significant independent variable values in the model is successively altered. The results are displayed in Table 7. For example, line 1 of Table 7 shows the probability that a notional person from the FY-79 cohort of hospitalman recruits will make HMC by the end of FY-92. The notional person is described as a white, male, general-duty (HM-0000) hospital corpsman. In this case, the notional person has a 2.1% probability of making HMC. Line 2 shows the probability that a person who possesses all the same characteristics as the notional person will be promoted to HMC, except that he possesses the HM-8401 NEC versus the HM-0000 NEC. Here, possessing the HM-8401 NEC increases the probability of making HMC to about 32%, while possessing the HM-8425 NEC increases the probability of making HMC to about 43%. Similar interpretations apply to the other variables shown in the table.

Observation	Probability	Variable
1	0.02122	NOTIONAL PERSON
2	0.32862	N8401
3	0.43049	N8425
4	0.08287	N8432
5	0.78735	N8493

Table 7. *MADEHMC* Model "Notional Person" Results.

C. *STAYEDIN* MODEL RESULTS

A methodology similar to the one used for the *MADEHMC* model was used for the *STAYEDIN* model. Therefore, those variables from the full *STAYEDIN* model that were insignificant (at a 95% confidence interval) were deleted from the model if they were not any of the primary variables under study. The remaining variables were used to create the restricted *STAYEDIN* model. The restricted *STAYEDIN* model results are shown in Table 8. Full *STAYEDIN* model results are shown in Appendix C.

As with the *MADEHMC* model, all variables except the primary variables under study were deleted from the full *STAYEDIN* model, because of insignificance, to

Ordered Value	STAYEDIN	Count
1	0	311
2	1	1523

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1671.715	1383.027	.
SC	1677.229	1614.626	.
-2 LOG L	1669.715	1299.027	370.687 with 41 DF (p=0.0001)
Score	.	.	514.108 with 41 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-2.5408	0.1269	400.5859	0.0001	.	0.079
HISPANIC	1	0.5760	0.1552	13.7651	0.0002	0.131407	1.779
BLACK	1	0.9708	0.3173	9.3583	0.0022	0.106699	2.640
FEMALE	1	0.3427	0.1647	4.3264	0.0375	0.080251	1.409
N8201	1	-0.5947	2.6685	0.0497	0.8236	-0.007656	0.552
N8294	1	-0.2520	1.5438	0.0267	0.8703	-0.005617	0.777
N8401	1	6.4353	1.3381	23.1278	0.0001	0.165558	623.442
N8402	1	6.7303	0.7493	80.6787	0.0001	0.311380	837.394
N8404	1	0.4928	0.1678	8.6234	0.0033	0.123268	1.637
N8406	1	0.7426	0.3864	3.6942	0.0546	0.067975	2.101
N8408	1	1.3520	1.3365	1.0232	0.3118	0.034782	3.865
N8409	1	2.0191	1.0948	3.4012	0.0651	0.063584	7.531
N8416	1	-0.2520	1.8886	0.0178	0.8938	-0.004587	0.777
N8425	1	5.7203	0.4474	163.4913	0.0001	0.449356	304.983
N8432	1	4.0958	0.5069	65.2879	0.0001	0.281775	60.085
N8433	1	-0.7867	1.5450	0.2593	0.6106	-0.017532	0.455
N8444	1	-0.4500	0.6973	0.4164	0.5187	-0.022351	0.638
N8445	1	1.2353	1.3387	0.8515	0.3561	0.031780	3.439
N8446	1	-0.4051	1.0934	0.1373	0.7110	-0.012758	0.667
N8451	1	0.0557	0.4766	0.0137	0.9069	0.004086	1.057
N8452	1	3.0154	0.4992	36.4811	0.0001	0.210939	20.398
N8454	1	-0.5400	1.3387	0.1627	0.6867	-0.013893	0.583
N8463	1	4.9780	0.7790	40.8369	0.0001	0.221333	145.177
N8466	1	2.1221	0.8099	6.8663	0.0088	0.090364	8.349
N8472	1	4.9883	1.3369	13.9230	0.0002	0.128332	146.684
N8477	1	-0.2520	1.8886	0.0178	0.8938	-0.004587	0.777
N8478	1	6.1397	0.7491	67.1796	0.0001	0.284057	463.930
N8479	1	6.8493	2.6679	6.5912	0.0102	0.088177	943.196
N8482	1	0.7135	0.3481	4.2004	0.0404	0.072754	2.041
N8483	1	0.4062	0.3041	1.7839	0.1817	0.047615	1.501
N8485	1	0.2102	0.4294	0.2397	0.6244	0.017141	1.234
N8486	1	-0.5674	1.3363	0.1803	0.6712	-0.014596	0.567

N8489	1	0.6067	0.6200	0.9575	0.3278	0.033878	1.834
N8491	1	6.8493	1.886	13.1527	0.0003	0.124667	943.196
N8492	1	3.8059	1.0152	14.0546	0.0002	0.129420	44.964
N8493	1	2.5885	1.1985	4.6647	0.0308	0.074433	13.310
N8495	1	0.9160	1.1960	0.5866	0.4438	0.026339	2.499
N8501	1	0.0292	0.5773	0.0026	0.9596	0.001755	1.030
N8503	1	-0.5947	2.6685	0.0497	0.8236	-0.007656	0.552
N8506	1	2.4161	0.4558	28.1042	0.0001	0.184841	11.203
N8541	1	0.4510	1.0123	0.1985	0.6559	0.015337	1.570
N8703	1	6.8493	2.6679	6.5912	0.0102	0.088177	943.196

Association of Predicted Probabilities and Observed Responses

Concordant = 76.1%	Somers' D = 0.578
Discordant = 18.3%	Gamma = 0.612
Tied = 5.6%	Tau-a = 0.163
(473653 pairs)	c = 0.789

Table 8. Restricted *STAYEDIN* Model Results.

create the restricted *STAYEDIN* model. However, in this model, the HISPANIC, BLACK, and FEMALE variables were all significant, as were many of the NEC variables.

A notional person variation of the restricted *STAYEDIN* model was created to measure the change in the probability of a hospitalman recruit remaining in the Navy for the full 14 year period that is associated with variable values other than those describing the notional person. Again, for the purposes of this model, the notional person is described as a white, male, general-duty hospital corpsman. The results of the notional person variation of the restricted *STAYEDIN* model are shown in Table 9.

Interpretation of the results shown in Table 9 is similar to the interpretation of the notional person *MADEHMC* model as described above. As shown in observation 1 of Table 9, a white, male, general-duty hospital corpman (i.e., the notional person) from the FY-79 cohort has a probability of staying in the Navy until the end of FY-92 of about 7.3%. However, Hispanics and blacks have probabilities of staying in the Navy for the full 14 year period of about 12% and 17%, respectively, as shown by

observations 2 and 3 from Table 9. White, male hospital corpsman from the FY-79 cohort who pursued certain specialized NECs had much higher probabilities of remaining in the Navy through FY-92 than their general-duty counterparts. For example, HM-8401s (observation 5) and HM-8402s (observation 6) have probabilities of staying in the Navy through FY-92 that approach 99%.

Observation	Probability	Variable
1	0.07305	NOTIONAL PERSON
2	0.12294	HISPANIC
3	0.17221	BLACK
4	0.09992	FEMALE
5	0.98005	N8401
6	0.98507	N8402
7	0.11426	N8404
8	0.96005	N8425
9	0.82563	N8432
10	0.61647	N8452
11	0.91962	N8463
12	0.39684	N8466
13	0.92038	N8472
14	0.97338	N8478
15	0.98672	N8479
16	0.13856	N8482
17	0.98672	N8491
18	0.77989	N8492
19	0.51192	N8493
20	0.46887	N8506
21	0.98672	N8703

Table 9. *STAYEDIN* Model "Notional Person" Results.

D. *FASTPROM* MODEL RESULTS

The results of the restricted *FASTPROM* model are shown in Table 10. This model eliminates any variables from the full *FASTPROM* model that were insignificant (at a 95% confidence interval), unless a variable was one of the primary variables under study. Full *FASTPROM* model results are shown in Appendix D. This model focuses solely on those individuals from the FY-79 cohort who were actually advanced

Ordered Value	FASTPROM	Count
1	0	47
2	1	22

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	88.387	108.368	.
SC	90.621	144.114	.
-2 LOG L	86.387	76.368	10.019 with 15 DF (p=0.8186)
Score	.	.	9.502 with 15 DF (p=0.8499)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-0.2653	1.0742	0.0610	0.8049	.	0.767
HISPANIC	1	0.3651	0.7947	0.2111	0.6459	0.074230	1.441
BLACK	1	0.0886	0.9797	0.0082	0.9280	0.014850	1.093
FEMALE	1	0.9602	0.9929	0.9353	0.3335	0.208524	2.612
N8401	1	1.5323	2.2906	0.4475	0.5035	0.101699	4.629
N8402	1	1.3413	1.3151	1.0404	0.3077	0.238496	3.824
N8404	1	0.5217	1.1868	0.1932	0.6602	0.113293	1.685
N8406	1	-1.4607	1.5152	0.9294	0.3350	-0.165437	0.232
N8425	1	0.9743	1.1318	0.7410	0.3893	0.255075	2.649
N8432	1	2.4925	1.6397	2.3106	0.1285	0.282287	12.091
N8452	1	2.4925	2.3996	1.0788	0.2990	0.165430	12.091
N8478	1	2.4925	2.3996	1.0788	0.2990	0.165430	12.091
N8483	1	-2.2006	2.5829	0.7259	0.3942	-0.146056	0.111
N8493	1	2.4925	1.8591	1.7975	0.1800	0.232226	12.091
N8491	1	0.1902	1.8591	0.0105	0.9185	0.017724	1.210
N8506	1	0.2880	1.4909	0.0373	0.8468	0.032617	1.334

Association of Predicted Probabilities and Observed Responses

Concordant = 64.2%	Somers' D = 0.390
Discordant = 25.2%	Gamma = 0.436
Tied = 10.5%	Tau-a = 0.172
(1034 pairs)	c = 0.695

Table 10. Restricted *FASTPROM* Model Results.

to HMC by the end of FY-92, which accounts for the smaller number of observations (N=69) and the smaller number of independent NEC variables.

All of the variables in either the full or the restricted *FASTPROM* models were insignificant as measured by Wald Chi-Square, at either a .01 or .05 confidence level. As a result, we can draw the conclusion that Hispanic, black, female, or specialized hospital corpsmen from the FY-79 cohort who were advanced to HMC were no more or less likely to be promoted quickly (within 11 years) to HMC than were their white, male, general-duty counterparts. Because all of the variables in Table 10 were insignificant, the notional person variation of the restricted *FASTPROM* model is omitted.

E. HYPOTHESIS STATEMENT CONCLUSIONS

1. Gender/Minority Issues

The results of the *MADEHMC* model indicate that the race or sex of a hospitalman recruit from the FY-79 did not significantly affect the probability of being promoted to HMC within the 14 year period under study. While the advancement progress to HMC of white males, as compared to the progress of women and minorities, is statistically equal (based on the results of the *MADEHMC* model), this equality cannot be directly attributed to the effects of any equal opportunity policies that may have been in place in the Navy during the timeframe under study. Nevertheless, the absence of any apparent statistical bias against women and minorities in the promotion process indicates that the Hospital Corps *has* been an equal opportunity environment, for whatever reasons.

There may even be a perception among women and minorities that there are better career opportunities for them in the Hospital Corps than in the civilian community. Horne, in his study of soldier quality on Army performance, hypothesizes that "gender and race may affect performance through a number of different avenues. Opportunities for education, training, or employment in the civilian sector may differ

by race or gender." [Ref. 16] And Buddin points to several studies by Blau and Kahn (1981), Burton and Parker (1969), and Chapman (1981) "which argue that members of minority groups are less quit-prone because discrimination reduces their available alternatives." [Ref. 9] These assertions are supported by the findings of the *STAYEDIN* model, in which women and minorities have greater probabilities of remaining in the Navy for the full 14 year period then their white male co-workers. If women and minorities who are mulling over their career choices perceive the Hospital Corps as providing favorable career progression opportunities, than it is reasonable to assume that they would remain in the Navy at greater rates than white males, who may perceive the civilian community as providing equally favorable, or better, career opportunities than the Navy.

The tendency for minorities, and blacks in particular, to have higher rates of retention in the military has been demonstrated in other military manpower studies, as discussed in Chapter II [Ref. 7, Ref.8, Ref.9]. The results of the *STAYEDIN* model further support those findings. Similarly, Webster and Booth's finding that women who entered the Hospital Corps were more certain about their career choice, and were better informed about their career choice than men, provides another possible explanation for why female hospitalman recruits from the FY-79 cohort have tended to stay in the Navy at greater rates than men [Ref. 14]. If female hospitalman recruits from the FY-79 cohort were also more certain about their career choice, and had a better understanding of it, this implies a better job fit which, arguably, leads to higher levels of job satisfaction. Higher job satisfaction could account for the greater willingness on the part of women, as shown in the *STAYEDIN* model results, to stay in the Navy.

The results of the *FASTPROM* model supports the assertion that the Hospital Corps has been an equal opportunity environment over the timeframe under study. These results indicate that women and minorities were equally likely or unlikely, as

compared with white males, to be advanced to HMC as "early candidates" (in 11 years or less). In other words, no negative bias toward women or minorities was apparent in the *FASTPROM* model results.

Based on the *MADEHMC* and *FASTPROM* model results, the first two hypothesis statements shown below, are accepted:

1. Women from the 1979 cohort of Navy recruits who entered the Hospital Corps and remained in the Navy for subsequent enlistments have had probabilities of being advanced to HMC that are equal to their male peers.

2. People of minority status from the 1979 cohort of Navy recruits who entered the Hospital Corps and remained in the Navy for subsequent enlistments have had probabilities of being advanced to HMC that are equal to their non-minority peers.

2. NEC Issues

There were no indications in the *FASTPROM* model results that attaining a specialized NEC either increased or decreased a hospitalman recruit's likelihood of being promoted quickly to HMC, as compared to a general-duty hospital corpsman. However, there are indications in the *STAYEDIN* and *MADEHMC* model results that some hospitalman recruits from the FY-79 cohort who pursued and attained certain specialized training while in the Navy were more likely than their general-duty counterparts to stay in the Navy for the 14 year period under study, and were more likely to make HMC. For example, the notional person *STAYEDIN* model results shown in Table 9 reveal that individuals who attained any of 17 NECs had probabilities of staying in the Navy for the 14-year period that were higher than the probability for general-duty hospital corpsman. Similarly, Table 7 reveals that hospitalman recruits who attained any of four NECs were more likely than general-duty hospital corpsman to make HMC within the 14-year period.

There are a number of plausible explanations for why some technicians were more likely, based on the *STAYEDIN* model results, to stay in the Navy than their

general-duty peers. First, hospital corpsmen who possess certain NECs are offered sizable reenlistment bonuses as enticement to remain in the Navy, which may account for their increased rates of retention. A second explanation is that for some specialized training, there is a minimum rank requirement. This means that for some C-schools, the students must be in their second term of enlistment before they are even eligible to attend the training. And previous military manpower studies have demonstrated that, in general, as an individual's time-in-service under 20 years increases, the likelihood that that person will leave the military before 20 years decreases, since leaving early would result in the loss of future retirement benefits.

Explanations for why certain technicians were more likely, based on the *MADEHMC* model results, to make HMC than general-duty hospital corpsman are less obvious. But since "sustained superior performance" is the primary criterion for advancement, and this criterion is measured by an individual's performance evaluation, it is likely then that the performance evaluations for people holding the NECs shown in Table 7 stand out from those of their peers [Ref. 4]. In reviewing the NECs in Table 7, it is noted that three of the NECs are operationally-oriented NECs. Search and Rescue Medical Technicians (HM-8401), Surface Force Independent Duty Technicians (HM-8425), and Medical Deep Sea Diving Technicians (HM-8493) are all likely to spend significant portions of their careers in operational, sea-duty type billets, whereas individuals who pursue some of the other NECs available to hospital corpsman will see little, if any, sea-duty. Since Navy policy is to advance to vacancies within ratings, and not the more narrow NEC category, an individual's NEC should not be a factor in the advancement selection process. However, BUPERS does allow selection boards to favorably consider sea-duty when selecting personnel for advancement to chief petty officer [Ref. 4]. It may be that the operational slant of these NECs has positively influenced selection boards.

Therefore, based on the *MADEHMC* model results, the third hypothesis, which states that "People from the 1979 cohort of Navy recruits who entered the Hospital Corps and remained in the Navy for subsequent enlistments have had equal probabilities of being advanced to HMC regardless of the NEC they possess," is rejected.

F. RECOMMENDATION FOR FURTHER STUDY

Perhaps the most unusual finding of this study was that, of the 69 individuals who made HMC, 13 of them (about 19%) had left either the Navy or the Hospital Corps by the end of FY-92. In this study, the average time-in-service to HMC for the 69 promotees was 124 months. Since it is unusual for someone with this amount of time invested in the service to leave before the 20 year point (and especially for someone who has advanced to the chief petty officer rank), this finding was somewhat disturbing. However, no attempt was made to determine why these individuals dropped out of the data set. It may be that they were selected for commissioning programs, or that they were discharged for medical reasons, or that they were discharged for disciplinary reasons. But if some left the service voluntarily, this represents a significant loss to the Navy of highly-trained, experienced personnel, and a problem which should be further studied.

It would also be interesting to test the assertions discussed above that the increased probability that individuals with certain NECs will stay in the Navy is, indeed, related to the effects of reenlistment bonuses and also whether that the increased likelihood that individuals with certain NECs will make HMC is, indeed, related to the effects of sea-duty.

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APPENDIX A. ARMED FORCES QUALIFICATION TEST SCORES CATEGORIES (ARMED FORCES MENTAL GROUPS)

Category:	Percentile Score:
V	1 - 9
IVc	10 - 15
IVb	16 - 20
IVa	21 - 30
IIIb	31 - 49
IIIa	50 - 64
II	65 - 92
I	93 - 99

Lower category numbers represent better test scores.

APPENDIX B. RESULTS OF FULL (UNRESTRICTED) *MADEHMC* MODEL

Ordered Value	MADEHMC	Count
1	0	69
2	1	1765

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	590.031	498.412	.
SC	595.546	768.610	.
-2 LOG L	588.031	400.412	187.620 with 48 DF (p=0.0001)
Score	.	.	581.990 with 48 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-3.9048	0.4980	61.4925	0.0001	.	0.020
TEEN	1	-0.0728	0.3074	0.0562	0.8127	-0.018773	0.930
HISPANIC	1	-0.00534	0.3571	0.0002	0.9881	-0.001218	0.995
BLACK	1	0.5200	0.5827	0.7965	0.3721	0.057158	1.682
HIGHAFQT	1	0.1305	0.3109	0.1761	0.6747	0.033020	1.139
DPNDENTS	1	-0.0404	0.6410	0.0040	0.9497	-0.004844	0.960
DIPLOMA	1	-1.1911	0.7021	2.8777	0.0898	-0.257560	0.304
SOMECOLL	1	-0.2119	0.7758	0.0746	0.7847	-0.022998	0.809
COLLDEG	1	1.7714	1.3804	1.6466	0.1994	0.055783	5.879
WENTCOLL	1	1.3140	0.7830	2.8165	0.0933	0.275025	3.721
FEMALE	1	0.2550	0.3568	0.5109	0.4748	0.059725	1.290
N8201	1	-0.4928	6.7234	0.0054	0.9416	-0.006345	0.611
N8294	1	-0.0458	3.8864	0.0001	0.9906	-0.001021	0.955
N8401	1	3.1476	1.0531	8.9338	0.0028	0.080978	23.280
N8402	1	3.0986	2.9917	1.0728	0.3003	0.143359	22.168
N8404	1	0.3518	0.3789	0.8620	0.3532	0.087989	1.422
N8406	1	0.8364	0.6892	1.4726	0.2249	0.076561	2.308
N8408	1	-0.3215	3.3564	0.0092	0.9237	-0.008271	0.725
N8409	1	-0.0993	2.7576	0.0013	0.9713	-0.003128	0.905
N8416	1	-0.1650	4.7611	0.0012	0.9724	-0.003003	0.848
N8425	1	3.5244	1.6472	4.5782	0.0324	0.276858	33.933
N8432	1	1.2011	0.7196	2.7857	0.0951	0.082629	3.324
N8433	1	-0.7250	3.6380	0.0397	0.8420	-0.016156	0.484
N8444	1	-0.1582	1.7429	0.0082	0.9277	-0.007859	0.854
N8445	1	-0.0191	3.3647	0.0000	0.9955	-0.000491	0.981
N8446	1	-0.1798	2.7480	0.0043	0.9478	-0.005663	0.835
N8451	1	-0.1321	1.1943	0.0122	0.9119	-0.009684	0.876
N8452	1	0.4289	1.0193	0.1771	0.6739	0.030005	1.536
N8454	1	-0.0538	3.3627	0.0003	0.9872	-0.001385	0.948

N8463	1	-0.0895	1.9573	0.0021	0.9635	-0.003981	0.914
N8466	1	-0.2265	2.0313	0.0124	0.9112	-0.009646	0.797
N8472	1	-0.8483	3.1537	0.0724	0.7879	-0.021824	0.428
N8477	1	-0.1414	4.7535	0.0009	0.9763	-0.002574	0.868
N8478	1	0.9007	1.1729	0.5897	0.4425	0.041673	2.461
N8479	1	-1.4289	6.7569	0.0447	0.8325	-0.018396	0.240
N8482	1	-0.2697	0.8490	0.1009	0.7507	-0.027499	0.764
N8483	1	0.0152	0.7074	0.0005	0.9829	0.001778	1.015
N8485	1	-0.2301	1.0463	0.0484	0.8259	-0.018762	0.794
N8486	1	-0.1806	3.3599	0.0029	0.9571	-0.004646	0.835
N8489	1	-0.1519	1.5523	0.0096	0.9220	-0.008483	0.859
N8491	1	13.8611	107.5	0.0166	0.8974	0.252294	999.000
N8492	1	-0.4620	2.4414	0.0358	0.8499	-0.015709	0.630
N8493	1	5.0556	1.3074	14.9524	0.0001	0.145375	156.893
N8495	1	-0.1962	2.9975	0.0043	0.9478	-0.005642	0.822
N8501	1	-0.2335	1.4469	0.0260	0.8718	-0.014019	0.792
N8503	1	-0.3624	6.7218	0.0029	0.9570	-0.004665	0.696
N8506	1	0.9163	0.7038	1.6949	0.1930	0.070101	2.500
N8541	1	-0.2118	2.5414	0.0069	0.9336	-0.007202	0.809
N8703	1	-0.1650	6.7218	0.0006	0.9804	-0.002124	0.848

Association of Predicted Probabilities and Observed Responses

Concordant = 87.4%	Somers' D = 0.778
Discordant = 9.6%	Gamma = 0.802
Tied = 3.0%	Tau-a = 0.056
(121785 pairs)	c = 0.889

APPENDIX C. RESULTS OF FULL (UNRESTRICTED) *STAYEDIN* MODEL

Ordered Value	STAYEDIN	Count
1	0	311
2	1	1523

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	1671.715	1374.658	.
SC	1677.229	1644.857	.
-2 LOG L	1669.715	1276.658	393.056 with 48 DF (p=0.0001)
Score	.	.	531.856 with 48 DF (p=0.0001)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	-2.8348	0.2187	167.9685	0.0001	.	0.059
TEEN	1	0.1147	0.1438	0.6363	0.4251	0.029566	1.122
HISPANIC	1	0.4908	0.1612	9.2663	0.0023	0.111967	1.634
BLACK	1	0.8638	0.3281	6.9300	0.0085	0.094937	2.372
HIGHAFQT	1	-0.2918	0.1462	3.9818	0.0460	-0.073845	0.747
DPNDENTS	1	-0.2046	0.2981	0.4711	0.4925	-0.024507	0.815
DIPLOMA	1	-1.0412	0.5475	3.6168	0.0572	-0.225151	0.353
SOMECOLL	1	0.4122	0.3414	1.4577	0.2273	0.044734	1.510
COLLDEG	1	0.2675	1.1675	0.0525	0.8188	0.008424	1.307
FEMALE	1	0.2699	0.1672	2.6071	0.1064	0.063216	1.310
WENTCOLL	1	1.4760	0.5679	6.7558	0.0093	0.308932	4.376
N8201	1	-0.3710	2.6721	0.0193	0.8896	-0.004777	0.690
N8294	1	-0.0440	1.5465	0.0008	0.9773	-0.000981	0.957
N8401	1	6.3444	1.3391	22.4477	0.0001	0.163221	569.307
N8402	1	6.6863	0.7503	79.4057	0.0001	0.309343	801.323
N8404	1	0.4339	0.1691	6.5849	0.0103	0.108528	1.543
N8406	1	0.6486	0.3874	2.8028	0.0941	0.059365	1.913
N8408	1	1.6193	1.3416	1.4567	0.2275	0.041659	5.049
N8409	1	1.9236	1.0975	3.0721	0.0796	0.060577	6.845
N8416	1	-0.2158	1.8925	0.0130	0.9092	-0.003929	0.806
N8425	1	5.6948	0.4500	160.1569	0.0001	0.447358	297.323
N8432	1	3.9971	0.5147	60.3052	0.0001	0.274989	54.441
N8433	1	-1.2500	1.5552	0.6460	0.4215	-0.027857	0.287
N8444	1	-0.4990	0.6983	0.5106	0.4749	-0.024784	0.607
N8445	1	1.1583	1.3409	0.7462	0.3877	0.029799	3.184
N8446	1	-0.4311	1.0954	0.1549	0.6939	-0.013577	0.650
N8451	1	-0.0245	0.4779	0.0026	0.9591	-0.001798	0.976

N8452	1	3.0292	0.5010	36.5573	0.0001	0.211901	20.680
N8454	1	-0.5427	1.3389	0.1643	0.6853	-0.013961	0.581
N8463	1	4.9859	0.7797	40.8919	0.0001	0.221686	146.336
N8466	1	2.0609	0.8117	6.4467	0.0111	0.087754	7.853
N8472	1	4.5065	1.3657	10.8881	0.0010	0.115937	90.601
N8477	1	0.0589	1.8916	0.0010	0.9751	0.001073	1.061
N8478	1	5.8439	0.7562	59.7191	0.0001	0.270371	345.125
N8479	1	5.9590	2.7255	4.7801	0.0288	0.076715	387.210
N8482	1	0.6597	0.3517	3.5180	0.0607	0.067263	1.934
N8483	1	0.3688	0.3060	1.4527	0.2281	0.043238	1.446
N8485	1	0.1343	0.4306	0.0973	0.7551	0.010948	1.144
N8486	1	-0.7366	1.3375	0.3033	0.5818	-0.018950	0.479
N8489	1	0.5387	0.6208	0.7530	0.3855	0.030083	1.714
N8491	1	6.9428	1.8922	13.4635	0.0002	0.126370	999.000
N8492	1	3.4009	1.0300	10.9015	0.0010	0.115648	29.991
N8493	1	2.6992	1.2008	5.0526	0.0246	0.077616	14.868
N8495	1	0.9561	1.1964	0.6386	0.4242	0.027493	2.601
N8501	1	-0.1259	0.5795	0.0472	0.8279	-0.007561	0.882
N8503	1	-0.6628	2.6710	0.0616	0.8040	-0.008533	0.515
N8506	1	2.3983	0.4614	27.0179	0.0001	0.183478	11.005
N8541	1	0.3924	1.0141	0.1497	0.6988	0.013344	1.481
N8703	1	6.8855	2.6706	6.6472	0.0099	0.088643	977.965
N8466	1	2.0609	0.8117	6.4467	0.0111	0.087754	7.853

Association of Predicted Probabilities and Observed Responses

Concordant = 79.4%	Somers' D = 0.606
Discordant = 18.8%	Gamma = 0.617
Tied = 1.8%	Tau-a = 0.171
(473653 pairs)	c = 0.803

APPENDIX D. RESULTS OF FULL (UNRESTRICTED) *FASTPROM* MODEL

Ordered Value	FASTPROM	Count
1	0	47
2	1	22

Criteria for Assessing Model Fit

Criterion	Intercept Only	Intercept and Covariates	Chi-Square for Covariates
AIC	88.387	106.550	.
SC	90.621	157.935	.
-2 LOG L	86.387	60.550	25.837 with 22 DF (p=0.2588)
Score	.	.	23.582 with 22 DF (p=0.3695)

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	0.7028	1.7024	0.1704	0.6797	.	2.019
TEEN	1	0.3261	0.7067	0.2130	0.6444	0.086269	1.386
HISPANIC	1	0.6681	0.9118	0.5369	0.4637	0.135835	1.951
BLACK	1	1.2983	1.1885	1.1934	0.2746	0.217704	3.663
HIGHAFQT	1	0.8560	0.6751	1.6078	0.2048	0.237072	2.354
DPNDENTS	1	2.9891	1.5940	3.5164	0.0608	0.338536	19.868
DIPLOMA	1	1.0061	1.6883	0.3551	0.5512	0.188175	2.735
SOMECOLL	1	-2.0665	1.8437	1.2563	0.2624	-0.234045	0.127
COLLDEG	1	-3.4502	3.3453	1.0637	0.3024	-0.228998	0.032
WENTCOLL	1	-3.0395	1.8455	2.7127	0.0996	-0.475649	0.048
FEMALE	1	1.2660	1.1009	1.3224	0.2502	0.274929	3.547
N8401	1	1.9657	2.3756	0.6847	0.4080	0.130470	7.140
N8402	1	1.8411	1.3390	1.8905	0.1691	0.327359	6.304
N8404	1	0.3432	1.2010	0.0816	0.7751	0.074528	1.409
N8406	1	-1.7551	1.7214	1.0396	0.3079	-0.198781	0.173
N8425	1	1.0153	1.1751	0.7466	0.3876	0.265814	2.760
N8432	1	2.4273	1.8121	1.7943	0.1804	0.274907	11.328
N8452	1	3.2317	2.4214	1.7812	0.1820	0.214495	25.323
N8478	1	2.3757	2.4547	0.9367	0.3331	0.157681	10.759
N8483	1	-2.6711	2.6850	0.9897	0.3198	-0.177286	0.069
N8491	1	0.2366	1.9466	0.0148	0.9033	0.022040	1.267
N8493	1	2.5388	1.9466	1.7009	0.1922	0.236542	12.664
N8506	1	1.9058	1.7747	1.1533	0.2829	0.215844	6.725

Association of Predicted Probabilities and Observed Responses

Concordant = 87.0%	Somers' D = 0.761
Discordant = 10.9%	Gamma = 0.777
Tied = 2.0%	Tau-a = 0.335
(1034 pairs)	c = 0.881

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